Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Parts 2 and 97 of	)	
the Commission's Rules Regarding	)	RM-7747
an Allocation of the 216-220 MHz	)	
Band for the Amateur Services	)	

To: the Commission

PETITION FOR RULE MAKING

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SUMMARY

The American Radio Relay League, Incorporated respectfully requests that the Commission initiate a Notice of Proposed Rule Making looking toward the Amendment of the Table of Frequency Allocations, Section 2.106 of the Commission's Rules, and various Sections of Part 97 of the Rules, to provide a secondary, non-interference allocation for the Amateur Radio Service at 216-220 MHz. This allocation would provide reaccommodation for those present and future wideband data intercity links and other point-to-point fixed amateur stations which stand, by August of this year, to be displaced from the 220-222 MHz band as a result of the reallocation of that segment in Docket 87-14.

Significant use of the 216-220 MHz band by amateurs can be made for point-to-point communications between fixed stations, notwithstanding the presence of the AMTS waterway communications systems, existing mobile assignments, and the possible future interactive television systems proposed for the 218-218.5 MHz band. The League's consulting engineers have made a compatibility analysis of amateur operation at 216-220 MHz, and the potential for interference to existing licensees. The findings of that study are that the Amateur Service could effectively operate in the 216-220 MHz band subject to appropriate frequency and distance separations constraints. This is true even if usage of the band grows substantially beyond current levels.

It is also apparent that such amateur operation can be conducted without interference to television channel 11 or 13 reception, provided that certain coordination procedures are followed in areas in and adjacent to the Grade B signal contours of Channel 13 stations. The League conducted empirical analysis of such interference potential, and an engineering study reporting the findings is attached.

Because the Amateur Radio Service is in the process of implementing nationally an emergency data communications network of unprecedented speed and accuracy, and because the development of intercity linking of local networks has been impeded by the loss of the 220-222 MHz band, the creation of a secondary allocation for amateurs, as suggested by the Commission in Docket 87-14 and elsewhere, is of critical importance. The amateur occupancy of the remaining 222-225 MHz band is incompatible with such links, and other bands are not suitable substitutes.

It is thus requested that the 216-220 MHz band be made available to the Amateur Radio Service on a secondary basis, subject to reasonable sharing constraints, and procedures to protect existing and future users from co-channel and adjacent channel interference.

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To: the Commission

PETITION FOR RULE MAKING

The American Radio Relay League, Incorporated (the League), the national association of Amateur Radio Operators in the United States, hereby respectfully requests that the Commission issue a Notice of Proposed Rule Making at the earliest possible time looking toward modification of Parts 2 and 97 of the Commission's Rules as set forth in the attached Appendix, in order to establish an allocation for the Amateur Radio Service in the band 216-220 MHz, which allocation would be on a secondary basis to the Fixed and Mobile Services to which the band is presently allocated. Such an Amateur Radio allocation, as proposed, would be limited to operation at fixed points, with certain frequency and geographical limitations. It would be made on a non-interference, coordinated basis with respect to existing and planned services in that same band. As good cause for the issuance of the requested notice of proposed rule making, the League states as follows:

I. Introduction and Background

1. The allocation of the 216-225 MHz band has been the subject of significant rule making action in recent years. Most recently, the Commission determined in General Docket 87-14 to reallocate the 220-222 MHz segment thereof to the Government and Non-Government Land Mobile Services, and to delete the Amateur Radio Service allocation at 220-222 MHz.[1] This had the practical effect of reduction of the Amateur allocation at 220-225 MHz, which had been in effect for many years, from 5 MHz to only 3. The 222-225 MHz band is now allocated to the Amateur Radio Service on a primary basis. It is the loss of this 2 MHz allocation[2], and the resultant loss to the Amateur Radio Service of the ability to initiate new, and extremely efficient digital radio technology therein, that is sought to be addressed by the instant petition.

(A) 220-225 MHz

2. The Amateur Radio Service has made use of a 5 MHz allocation in the vicinity of 220-225 MHz since the early 1930s.

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[1] See, the Notice of Proposed Rule Making, FCC 87-45, 2 FCC Rcd. 796 (1987); The Report and Order in that proceeding, 3 FCC Rcd 5287 (1988); affirmed on reconsideration by Memorandum Opinion and Order, 4 FCC Rcd 6407 (1989); review denied sub nom. American Radio Relay League, Inc. v. Federal Communications Commission, ___ F. 2d ___ (D.C. Cir. 1990).

[2] On May 13, 1991, the Commission issued a Public Notice stating that the 220-222 MHz band would be removed from the Amateur Radio Services, and that Amateur Operation in that Band would be prohibited after August 27, 1991. See, 56 Fed. Reg. 23068. The notice further stated that any application for continued amateur operation, be it by waiver, special temporary authority, or experimental or developmental license, would be disfavored.

The Service was allocated the entire 220-225 MHz segment in 1946.[3] This was a substitute allocation. Prior to that, the Amateur Service had occupied 235-240 MHz. In 1958, the amateur allocation was reduced to secondary, with military use primary, premised on National security considerations. Government radiolocation use has, however, traditionally been quite light, leaving the band essentially open for increasing usage by amateur radio operators.[4]

3. In 1978, in preparing for the 1979 World Administrative Radio Conference in Geneva (WARC-79), the Commission issued, following nine notices of inquiry, a Report and Order[5] in Docket 20271, which considered, but affirmatively rejected a proposal for land mobile service operation in the 220-225 MHz band. The Commission's ultimate proposal avoided reduction of the Amateur Radio Service's access to the entire 220-225 MHz band, although secondary status for the Amateur allocation was envisioned. The

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[3] See, In Re Frequency Allocations: 25,000-30,000,000 Kc, 39 FCC 245, 248 (1946).

[4] Pursuant to Footnote US243 to the Table of Frequency Allocations in Section 2.106 of the Commission's Rules, the Government Radiolocation Service was primary in the 1.25 meter band until January 1, 1990. That date having passed, the Government radiolocation service is now secondary to other radio services in the 1.25 meter band. The Commission has recently amended Section 97.303(b) of the Amateur Radio Service Rules in order to conform those rules to the allocation status of the band as reflected in the table contained in Section 2.106. See, the Order, Editorial Amendment of Part 97 of the Commission's Rules Regarding the Amateur Radio Service, DA 91-543, released May 3, 1991, 56 Fed Reg. 23024.

[5] See the Report and Order, FCC 78-489, 44 Fed. Reg. 2683, released December 28, 1978, at paragraphs 101-103.

entire 216-225 MHz segment was proposed by the United States for Maritime Mobile operation, but the Amateur Radio Service was to retain a continued secondary allocation at 220-225 MHz, as it had been occupying that segment all along. At WARC-79, the United States plan for the 216-225 MHz band was not adopted. The Final Acts established co-primary amateur, fixed and mobile allocations within Region 2 in the 220-225 MHz segment. A secondary allocation for radiolocation was maintained after January 1, 1990, for existing stations only.

(B) 216-220 MHz

4. The 216-220 MHz segment, following WARC-79, was allocated on a primary basis to the Maritime Mobile Service, thus to accommodate Automated Maritime Telecommunications Systems (AMTS) in specific geographical regions of the country.[6] AMTS use has just recently been expanded in the 216-220 MHz band by a First Report and Order in Docket 88-371.[7] AMTS provides automated, integrated, interconnected ship-to-shore communications. The AMTS is similar to a cellular telephone service, but as well includes non-voice

[6] See, the Report and Order in General Docket 80-1, 46 Fed. Reg. 15690, 84 FCC 2d 875, recon., 88 FCC 2d 678 (1981), affirmed sub nom. WJG Tel. Co., Inc. v. FCC, 675 F.2d 386 (D.C. Cir. 1982). See also the First Report and Order in Docket 88-371, 6 FCC Rcd. 437 (1991) by which the Commission amended the Part 80 Rules to permit AMTS operations on a nationwide basis. A second report and order in the Docket 88-371 proceeding, dealing with AMTS use of frequencies below 217 MHz in areas proximate to television channel 13 stations, is pending.

[7] Id.

services for vessels moving along a waterway. There are rules governing applications for stations in this service within 169 kilometers of a Channel 13 broadcast television station, or within 129 kilometers of a Channel 10 television station, to prevent interference.[8] These include engineering studies showing the means of interference avoidance within the Grade B contour of the TV station.

5. A condition of the allocation to AMTS was, and is, that no harmful interference be caused to television reception. Two of the four, 20-channel AMTS groups cannot be used in TV Channel 13 grade B contours, as they are closer in frequency to TV Channel 13 than are the other two groups.[9] Finally, the AMTS licensee is required to eliminate any interference caused within the TV channel 13 station's Grade B signal contour within 90 days of being informed of the interference by the Commission. If the interference is not eliminated within that time, the operation of the offending AMTS station must be discontinued.

6. The Commission has chosen to expand the AMTS service nationwide. The First Report and Order in Docket 88-371 noted that there is at present only one AMTS system, licensed to Watercom, serving the Mississippi River System. First authorized in 1982, Watercom completed the system in 1987. No complaints of

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[8] See, Sections 80.475 and 80.215 of the Commission's Rules (47 C.F.R. Sections 80.475 and 80.215).

[9] See, Sections 80.215(h)(5) and 80.385(a)(2) of the Commission's Rules.

interference have been received. This factor was primary among the stated bases for expansion of the AMTS system. It was noted in that rule making proceeding that, notwithstanding the assignment of TV Channel 13 licenses to cities proximate to the Mississippi River, there have been no reports of interference.

7. The Commission has also noted that there are other services which share spectrum adjacent to other television channels, most notably private land mobile stations adjacent to Channels 14 and 69, which, for years, have operated without adverse effect on TV reception.[10] In fact, the Commission noted, experience has shown that it is more likely that land mobile stations will receive interference from broadcast television transmissions than that television receivers will receive interference from land mobile transmissions. In this regard, in a recent proceeding examining the issue of land mobile operating in spectrum adjacent to a TV allocation, the Commission noted that land mobile interference to television reception, given current TV transmission standards, does not appear to be a significant problem, or at least not a problem of sufficient magnitude to warrant government regulation.[11]

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[10] First Report and Order, supra, 6 FCC Rcd. at 439.

[11] See, Resolution of Interference Between UHF Channels 14 and 69 and Adjacent Channel Land Mobile Operations, 2 FCC Rcd. 7328, 7331 (1987). There, the Commission stated, in part, that:

> We note that, in recent years, in excess of thirty television stations on Channel 14, and three on Channel 69, have been successfully operating in communities with adjacent-channel land mobile operations. Based on that experience, we predict that the new television stations operating on those UHF channels should continue to

8. Neither was the Commission persuaded by arguments of broadcasters that future Advanced Television (ATV) will be adversely sensitive to interference, since ATV will be accommodated within spectrum allocated to the broadcasting service, not the Maritime Mobile service. With respect to the AMTS channels in Groups "C" and "D", closer in frequency to Channel 13 (210-216 MHz) than the "A" and "B" channels, the Commission will allow AMTS operation on the former channels within the Grade B contours, if an interference protection engineering analysis is conducted in advance of licensing the AMTS station.

9. At approximately the same time that the Commission expanded AMTS operation, it also issued a Notice of Proposed Rule Making[12] proposing to amend the rules to establish an interactive video data service (IVDS) in the 218-218.5 MHz band. The Notice was issued in response to a petition for rule making filed in December of 1987 by TV Answer, Inc. The proposed IVDS system would allegedly allow viewers to respond to queries associated with television programming, order products and services, and offer educational and other information. This system could be associated with commercial and educational broadcast television, cable, and direct broadcast satellite service.

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provide a quality signal to their viewing audience notwithstanding the presence of additional adjacent-band land mobile operations in their area.

[12] See the Notice of Proposed Rule Making, Gen. Docket 91-2, FCC 91-16, released March 4, 1991.

10. The IVDS system would be limited to a maximum transmitter power from the over-the-air transmitters of 20 watts, depending on the geographical location of the IVDS transmitter within or outside of the grade B signal contour of a television Channel 13 broadcast transmitter. Though significant opposition to the proposal was received at the rule making petition stage, the Commission has proposed the allocation of either the 218-218.5 MHz or the 218.5-219 MHz segment[13] for IVDS operation. It stated that, in developing its technical goals for the service, the Commission wants to provide as much flexibility for the use of alternative IVDS technology as possible, while protecting against harmful interference to TV Channel 13 service, or to AMTS operation. Technical protection criteria are required near the Grade B transition area for television interference protection. Accordingly, limitations on maximum ERP of IVDS local base stations are proposed.

11. Because the TV Answer plan for IVDS involves base transmitters in residences for audience response systems, output power control would be required to minimize the amount of power necessary to reach the local base collector receiver. TV Answer also proposes to provide notch filters to households in Channel 13 viewing areas which experience interference to television channel

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[13] These alternatives are related to the possible impact on AMTS operation on those same channels. Comment was also solicited on the relative impacts of these alternatives on television channel 13 reception.

13 reception. The system would use digital pulses, modulated in both duration and phase, using ten, 50 kHz channels.

12. Notwithstanding the present plans for allocation of the 216-220 MHz band discussed herein, present occupancy of that band is apparently quite light, and has been for some time. While the expansion of the AMTS system nationally, and the possible provision of spectrum in a limited segment of the 216-220 MHz band are factors to be considered in any proposed expanded allocation plan for the band, as is the need to protect TV channel 13 viewers from interference, there appears a significant opportunity for additional operation in segments of the band on certain frequencies in vast areas of the country.

II. Need For Amateur Replacement Spectrum at 216-220 MHz

13. As noted briefly above, the result of Docket 87-14 was the net loss to the Amateur Radio Service of 2 MHz of important spectrum. That segment, though part of the 220-225 MHz overall amateur allocation, was unique in that, due to previous regulatory and historical reasons, the segment was not populated with amateur radio repeaters. It was thus planned, and to a certain extent already implemented, for high-speed, inter-city packet radio use. The loss to the Service of the 220-222 MHz segment by Docket 87-14 left the Amateur Radio Service without a reasonable substitute for such high-speed links, and the development of a truly unique nationwide communications system with unparalleled emergency preparedness and national defense capabilities. The opportunity now

exists for the replacement of some of that loss by the creation of a secondary, non-interference allocation of the 216-220 MHz band for point-to-point amateur use, and particularly high-speed digital communications, on a coordinated basis.

14. Though the Commission assumed in Docket 87-14 that the Service could reaccommodate displaced 220-222 MHz amateur operations by merely consolidating them in the remaining 222-225 MHz segment, this is simply not possible, because of differences in the technology used in the different segments. The 222-225 MHz segment is populated primarily with voice repeaters. Due to the growth of the Amateur Radio Service generally, and the repeater system in the United States in particular, the growth in the number of repeaters, in the 222-225 MHz band and elsewhere, is extremely rapid[14]. This, and the growth in the use of the band following the extension of voice operating authority to Novice class amateur licensees, and the establishment of a codeless class of amateur radio license with operating privileges in the 222-225 MHz band, makes for a band that is fully occupied in many areas of the country. The wideband, inter-city packet links cannot be inserted into this segment, as there is no room to accommodate the wideband

[14] In 1981, there were a total of 483 repeaters listed in the League's Repeater Directory in the 220-225 MHz band. By 1987, the number had grown to 1,192, constituting an increase of 145 percent in only six years. This does not, of course recognize the increase in the number of mobile users associated with the additional 220 Mhz repeaters. The 1990-91 Repeater Directory shows a total of 1,593 repeaters in the band, thus continuing the same growth spiral, notwithstanding the reduction in the band. This number reflects the growth in amateur use of the 222-225 Mhz band following the grant of operating privileges therein to Novice class amateur licensees.

channels necessary for high speed packet operation[15]. The relative absence of repeaters in the 220-222 MHz segment was the basis for its focus for the development of wideband packet operation[16]. Production quality, high-speed radio modems operating at speeds of 9,600, 19,200 and 56,000 bits per second are now becoming available to amateurs. Most were designed specifically for the amateur 220 MHz band. Along with the developments in higher level protocols, these modems promise a quantum leap in the ability of amateurs to handle emergency relief traffic. These systems simply cannot operate at 222-225 MHz, due to the growth in mobile and repeater

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[15] This was made quite clear by the commenters in Docket 87-14. For example, the Vermont Independent Coordinating Committee (VIRCC), a repeater and remote base coordinator in Vermont, noted in comments in that proceeding that:

> As coordinator for this area, we have access to regional data covering most of the Northeast on usage of 220-225 MHz. Our data clearly indicates that the spectrum is not underutilized and is growing faster than any other amateur band. We are already past the point where activity occurring in the 220-222 MHz portion of the band could be accommodated at 222-225 MHz. There is too much activity to allow this without causing severe degradation of the existing service.

[16] As the Commission knows from Docket 87-14, the reason for the absence of repeaters from the 220-222 MHz segment was partly historical. Repeaters were banned from that segment initially. See, the Report and Order, 37 FCC 2d 225 (1972). When the amateur rules were changed to permit repeaters below 222 MHz, (by Report and Order, 66 FCC 2d 207 (1977)), the amateur radio operating patterns were reasonably well-established, and the 220-222 MHz segment was the province of weak-signal experimenters and fixed links. Only in the most crowded areas, such as Southern California, were repeaters later allowed to "spill over" into the 220-222 MHz segment, since the 222-225 MHz segment was essentially full in those areas.

operation in the band. Some replacement for the lost 220-222 MHz segment is mandatory for these new systems to develop.

15. In Docket 87-14, the Commission was shown the capabilities of the national amateur radio packet system. Packet radio has grown significantly over the last five years. It was estimated in Docket 87-14 that over 30,000 packet stations existed in 1987. That number is far exceeded now, and is estimated to exceed 100,000. Much localized packet operation occurs in the amateur 144-148 MHz band, and to a lesser extent, in the 420-450 MHz allocation. However, the wider bandwidths necessary for inter-city packet radio operation (due to the speed of the communications and the volume of traffic which must be relayed) cannot be accommodated in other amateur bands, either below 216 MHz because of intensive loading, skywave interference, and/or the regulatory characteristics of those bands, or above 222 MHz because of band loading, sharing, or path length characteristics.[17]

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[17] Comments filed in Docket 87-14 by amateurs explained the packet network well:

> In 1981-82 a small group of Arizona amateurs decided to pursue the development of amateur packet radio. A nonprofit, purely amateur organization came into being. This group has been the single most motivating element in the growth of amateur packet radio, from fewer than 200 packet equipped stations in 1982 to an unknown (but well over 30,000) figure today.
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> *****
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> The amateur radio packet system today consists of hundreds of cells of local users throughout the country. The ultimate system foresees all of these cells being combined onto a single high-speed terrestrial system. The hardware for this system has been developed by amateurs. At least four software systems to make the national system work are in the late stages of development, by amateurs. Within six to twelve months we can see a very

16. The 220-222 MHz segment was identified as both necessary and ideal for such use, because of the relative absence of amateur repeaters, and because of the bandwidth available and the propagation characteristics of the band.[18] Though the Commission assumed from the outset that the 220-222 MHz segment was "lightly

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> sophisticated amateur telecommunications system in operation. When completed it will provide the nation with an amateur digital emergency communications network whose speed, efficiency and accuracy has heretofore never been visualized.
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> Since the basic unit of the system is the user on two meters, it was also recognized that the introduction of packet radio would impose an additional load on the already busy 2 meter frequencies. For this reason, it has been assumed from the outset that the 220 MHz area would be the natural home for the packet radio terrestrial linking system.

The commenter, Andrew W. Freeborn, concluded correctly in his 1987 comments that the amateur-developed equipment has been incorporated into communications schemes at the highest levels of government. The armed forces are using versions of the same technology by deployed troops. The loss of the 220-222 MHz band, predicted Freeborn, erects an absolute roadblock to the orderly growth and implementation of the packet radio terrestrial networking system, and the national emergency communications system it is to serve.

[18] The critical nature of the 220-222 MHz segment for growth of high-speed packet network links is understood when one considers the greater bandwidth available in that segment than in the 144-148 MHz band. The extremely heavy loading and daily use of the 144-148 MHz band makes it absolutely impossible, even if regulations permitted it, for high-speed packet links to be added to the existing uses of the band. The bandwidths available at 220-222 MHz would have permitted higher-speed communications than do the narrow channels available for localized, intra-city packet radio at 144-148 MHz. Further, the 220-222 MHz band was similar in propagation characteristics to the 144-148 MHz band. The 420-450 MHz band, by comparison, cannot support the path lengths of 60-100 miles necessary for such links due to propagation limitations. The 220-222 MHz segment was thus unique for this application, and hence critical to the vast array of new packet networks which provide previously unheard-of emergency message handling capabilities.

loaded", an extremely large number of amateur radio operators have lost the ability to utilize fixed stations formerly in that band. Moreover, the segment was increasingly and critically important for the development of high-speed packet network links.

17. Because of the severe adverse impact of the Docket 87-14 proceeding on the Amateur Radio Service, the interest of the Secretary of Defense (DOD), on behalf of the National Communications System (NCS) in the proceeding was triggered. NCS' interest in the matter was the adverse effect of the reallocation of 220-222 MHz on the ability of the Amateur Radio Service to provide emergency and national security preparedness (NSEP) communications. NCS had been planning for the use of amateur communications in NSEP operations, and had entered into a memorandum of understanding with the League in connection with such cooperation. This resulted in the filing of reply comments in the proceeding in which the Secretary of Defense stated that:

> The deprivation of these types of communication resources, which would be vital in times of emergency or crisis, could significantly hamper the ability of the NCS to carry out its responsibilities in the area of national security.[19]

Those reply comments urged the Commission to develop an alternative plan which would not require the Amateur Radio Service to vacate the 220-222 MHz band. Later, after the Commission made the reallocation, the NCS petitioned for reconsideration, arguing that

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[19] See, Reply Comments of the Secretary of Defense, April 28, 1988.

the Commission had given insufficient consideration to the NSEP needs of NCS in reallocating the amateur radio spectrum.

18. The Government Information, Justice and Agriculture Subcommittee of the Committee on Government Operations of the House of Representatives held a hearing May 11, 1989 on the subject of the 220-222 MHz reallocation.[20] The hearing was held after the FCC had made its initial decision to reallocate the 220-222 MHz band, but before that decision had been affirmed administratively on appeal. Following that hearing, the Chairman of the Government Information, Justice and Agriculture Subcommittee wrote FCC Chairman Patrick, suggesting that, as the result of the hearing, it appeared that "too little thought has been given to potential compromises that might serve the needs of each of the various parties". That letter, dated June 7, 1989, suggested four alternatives which would provide for additional land mobile spectrum for narrowband systems, while not discouraging the development of the digital inter-city packet network in particular, and to the detriment of the Amateur Radio Service generally.

19. The first of those alternatives was the maintenance of the status quo; amateurs would retain 220-225 MHz, and the land mobile service would be allocated 218-220 MHz. The second and third alternatives involved the allocation to the Amateur Service of some substitute frequencies in the 216-220 MHz band, as well as

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[20] See, the Hearing Record, "Federal Communications Commission Reallocation of Ham Radio Frequencies", Committee on Government Operations, May 11, 1989.

retention of a greater portion of the 220-225 MHz band than proposed by the Commission. The fourth option suggested was that the Commission affirm its proposed taking of the 220-222 MHz band, but offer, as replacement spectrum, a secondary allocation at 216-220 MHz. Clearly, in view of the finality of the reallocation of the 220-222 MHz band in Docket 87-14, this fourth option is the only one remaining available. While this option had certain disadvantages as compared to the retention of 220-222 MHz, the other alternatives are now moot. Congressman Wise noted in his letter that:

> In all of these scenarios there needs to be retention of amateur capabilities in metropolitan areas where present and desirable future activity at 220-222 MHz cannot be shifted on top of what already exists at 222-225 MHz. The protection of channel 13 television reception from harmful interference is also important, as is the protection of existing fixed and waterways-related mobile activity at 216-220 MHz...

None of Congressman Wise's compromise suggestions were adopted, as it turned out.[21] The Commission affirmed, on reconsideration, its reallocation of the 220-222 MHz band to the Land Mobile Service, by its Memorandum Opinion and Order released August 17, 1989.

20. However, in rejecting the more than 550 Petitions for Reconsideration of the Commission's reallocation of the 220-222 MHz band, the Commission stated that it would entertain a request for replacement spectrum for the Amateur Radio Service, acknowledging that in certain areas of the country, some relief was justified

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[21] See, the Memorandum Opinion and Order, 4 FCC Rcd. 6407 (1989).

from the displacement of amateur operations as the result of the reallocation. The Commission stated:

> In its Petition for Reconsideration, the ARRL suggests that the Commission might have considered a secondary allocation in the 216-220 MHz band as replacement spectrum for displaced amateur users at 220-222 MHz. No such allocation was proposed or raised by the commenters in this proceeding. ARRL may, if it so chooses, submit a petition making a specific proposal. The petition would need to provide support for why an allocation is needed and show how amateur operations could use this band without causing interference to existing users of this spectrum or to adjacent TV channel 13 operations in the 210-216 MHz band.[22]

21. In a June 30, 1989 response to Congressman Wise's "compromise" suggestions, FCC Chairman Patrick stated that the Commission "did not consider" in any depth amateur use of the 216-220 MHz band in the Docket 87-14 proceeding. It was not proposed by the Commission, nor addressed in the comments. However, because the League addressed the subject in its reconsideration petition, the Commission invited the amateur community to make a specific proposal. This would allow, he said, full comment by all parties, and that:

> It is possible that some limited secondary fixed use of this band may be made by the amateur service in reaccommodating the amateur fixed operations from the 220-222 MHz band. The Commission noted that while it is willing to consider this matter, potential impact on other users of this spectrum, particularly potential interference to TV broadcasting, will need to be addressed.

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[22] Id., at Footnote 23.

In closing, Chairman Patrick stated that the Commission would continue to support the Amateur Service to ensure that its allocation requirements are met.

22. This petition is submitted of necessity in view of the imminent loss of access to the 220-222 MHz band. It is submitted in response to the Commission's invitation to do so, with the understanding that the Commission intends to seriously consider the proposal. The following establishes clearly that sharing of the 216-220 MHz band is entirely technically feasible, given certain accommodations for present and proposed users, and assuming certain basic private-sector coordination of amateur fixed station operation, which the League will undertake. Such a secondary allocation should provide some relief from the severe adverse impact on the establishment of a nationwide, high-speed packet radio network.

III. Technical Compatibility Analysis

(A) Television Receiver Interference Tests

23. The League, in 1990, requested and obtained Commission experimental licenses to operate certain test stations in the 216-220 MHz band, for the purposes of determining compatibility between typical amateur operation on the one hand and television receiver susceptibility on Channels 11 and 13 to adjacent-channel interference from those amateur transmitters. These tests were run in June of 1990. Subjective tests of five television receivers, chosen to represent those typically found at present in homes,

indicate that television reception on Channel 13 could be perceptibly affected by strong signals within the frequency range of 216 to 220 MHz. The test results show that this effect is less pronounced within the frequency range of 218 to 220 MHz. A minimal effect on channel 11 was noted under test conditions designed to test for intermodulation effects between a channel 13 television signal and a signal in the range of 216 to 220 MHz.

24. This study was conducted in order to determine the proper operating parameters for amateur radio communications in the 216-220 MHz band. The study utilized five television receivers of different manufacture, representing both switched-LC and varactor tuners. Each television receiver was used as it was received from a consumer rental business, and had been previously used. No filtering was added. The receivers are those typically found in residences. The receivers were tested to determine the susceptibility to overload from strong adjacent-service transmitters. One was also tested with an input-signal level of a grade-B contour television signal for susceptibility to signals in the 220-225 MHz range, to relate the interference-potential findings at 216-220 MHz to the present interference potential from amateur stations in the 220-225 MHz band.

25. The test signal into the television provided a picture quality equal to that of a typical home VCR picture. The procedure of the test was to observe the television picture for perceptible change, in the presence of various levels of 216-220 MHz signals. The procedure was designed using data from the 1975 FCC Laboratory

Division study of interference to Channels 11 and 13 from transmitters operating at 216-225 MHz.[23] Data were recorded in discrete 0.5 MHz steps. As it had previously been determined that there was no significant difference in terms of interference susceptibility as between CW and FM signals, only CW signals were used. Other test conditions were modeled after those in the Commission's 1975 test.

26. The test results show a rapidly diminishing interference potential as the adjacent-service signal moves from 216 MHz toward 218 MHz. The susceptibility is reduced more slowly as the adjacent service signal moves from 218 MHz toward 220 MHz. The 1975 Commission study shows that susceptibility is reduced even more slowly as the adjacent-service signal moves from 220 MHz toward 225 MHz. One of the League test television receivers was tested over the entire 216-225 MHz range. The graph is consistent with the Commission's study, showing relative consistency in interference potential from 219 MHz to 225 MHz. On the average, the interference susceptibility of the television receivers tested is 7 dB better than the 1975 FCC study over the frequency range of 216-220 MHz.

27. The overall conclusion which can be drawn from the study (a copy of which is attached hereto as Exhibit "A") is that there is a potential for interference to television channel 13 reception where the amateur radio transmitter is located in close proximity

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[23] See, Davis & Middlekamp, "Interference to TV Channels 11 and 13 from Transmitters Operating at 216 to 225 MHz"; Project No. 2299-71 (1975).

to the television receiver, and where the operating frequency of the transmitter is in the 216-218 MHz range. There appears far less risk of any interference from amateur operation above 218 MHz, and, above 219 MHz, there appears little interference potential. Amateur operation at 216-218 MHz well outside the Grade B signal contours of Channel 13 stations would avoid interference to television receivers, and point-to-point amateur fixed operation within the Grade B contours of television channel 13 stations would appear possible if conducted above 218 MHz.

(B) Compatibility Study Relative to Other Services at 216-220 MHz

28. In addition to the television receiver study, the League commissioned a study by the ARC Professional Services Group, C3I Systems Division. This is part of Atlantic Research Corporation. Attached as Exhibit "B" is a copy of the Report, entitled "Compatibility Assessment of the Amateur Service in the 216-220 MHz Band". The purpose of the study, just completed, was to determine the potential for sharing between, on the one hand, incumbent services (including IVDS systems, as proposed by the Commission in Docket 91-2) and the Amateur Radio Service.

29. An assessment was made of the domestic allocation tables to determine what services may be operating in the 216-220 MHz band. Representative equipment characteristics were compiled, and an EMC analysis was performed to determine the frequency sharing possibilities between existing services and the Amateur Radio

Service. Primarily, frequency/distance separation constraints were calculated.

30. A recent NTIA study[24] showed that the 216-220 MHz band is a sparsely used band by both Government and Non-Government Services. This is borne out by Table 2 of Exhibit B, which summarizes the number of individual assignments in the band, Government and Non-Government, by service. The FCC frequency master list shows that approximately 1,000 licensees are authorized with a majority being in the mobile services. Few assignments have been made to Government users.

31. The study assumes worst-case parameters. These especially include, with respect to antenna polarization and pointing, co-polar and mainbeam-to-mainbeam characteristics. The study thus notes that, in the vast majority of cases where the amateur station antenna is not pointed in the direction of the station in the other service, or orthogonal polarizations are used, 12 dB or more of discrimination would be readily available. The study discusses interference parameters of both high-speed packet stations and amateur repeater stations, though amateur repeaters are not proposed herein for use in the 216-220 MHz band. Thus, they are referenced for illustration purposes only. Amateur fixed uses in the band would primarily be displaced auxiliary stations, and wideband packet inter-city relays.

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[24] See, G. Patrick and M. Richmond, NTIA, "Assessment of the 216-225, 400.15-406, and 420-450 MHz Bands for Possible Wind Profiler Accommodation" (Annapolis, NTIA, Draft Dated September, 1990).